UNIBLITZ®
Shutter Systems
1.800.828.6972

User Manual

VMM-D3 Three Channel Shutter Driver
VMM-D4 Four Channel Shutter Driver

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Version 2.00
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Version 2.00

2013

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LIMITED PRODUCT WARRANTY: All Products manufactured by VINCENT ASSOCIATES® (MANUFACTURER) are warranted to meet published specifications and to be free of defects in materials and workmanship as defined in the specifications for 365 days - one year - (WARRANTY PERIOD) from the date of original shipment of the product. DSS series shutters are additionally warranted to achieve two million cycles within the WARRANTY PERIOD (as defined in the CYCLE WARRANTY CRITERION). MANUFACTURER will, at its own option within the WARRANTY PERIOD, repair or replace without charge any listed item discovered to be defective excepting transportation charges. Burned out or otherwise damaged actuator coils are not covered under this warranty. Any defective product returned to the MANUFACTURER must follow the RETURN MATERIAL AUTHORIZATION PROCEDURE as defined below. This warranty does not extend to cover damage resulting from alteration, misuse, negligence, abuse, normal wear and tear, or accident. The MANUFACTURER will consider the return of unused equipment if returned within 30 days from the original date of shipment, subject to a 20% restocking charge. This offer does not apply to used or damaged equipment. This warranty extends only to the original purchase and is not available to any third party, including any purchaser assemblies or other Products of which the goods may become component equipment.

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use the product only as specified.

Only qualified personnel should perform service procedures.

Injury Precautions

- **Use proper Power Cord –** To avoid fire hazard and risk of personal injury use only the power cord supplied with this product.
- **Avoid Electric Overload –** To avoid electrical shock or fire hazard do not apply a voltage to a terminal that is outside the range specified for that terminal.
- **Avoid Electric Shock –** To avoid injury or loss of life, do not connect or disconnect line cord while it is connected to the line voltage.
- **Ground the Product** – This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, the grounding connector must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded. **DO NOT DEFEAT THE GROUND CONNECTION ON THE SUPPLIED LINE CORD.**
- **Access to On/Off Switch** – Due to the location of the unit's On/Off switch on the rear panel, ***do not*** position the unit such that the On/Off switch is difficult to access and operate while installed and in use.
- **Do Not Operate Without Covers** – To avoid electric shock or fire hazard, do not operate this product with case or panels removed.
- **Use Proper Fuse** – To avoid fire hazard, use only the fuse type and rating specified for this product.
- **Do Not operate in Wet/Damp Conditions** – To avoid electric shock, do not operate this product in wet or damp conditions.
- **Do Not Operate in an Explosive Atmosphere** – To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

Product Damage Precautions

- **Use Proper Power Source** – Do not operate this product from a power source that applies more than the voltage specified.
- **Provide Proper Ventilation –** To prevent product overheating, provide proper ventilation.
- **Do Not Operate with Suspected Failures –** If you suspect there is damage to this product, have it inspected by qualified service personnel.

Safety Terms and Symbols

These terms appear in this manual

WARNING	*Warning statements identify conditions or practices that could result in injury or loss of life.*
CAUTION	*Caution statements identify conditions or practices that could result in damage to this product or other property.*

Preface

This Manual provides information for the **VMM-D3 Three Channel Shutter Driver** and **VMM-D4 Four Channel Shutter Driver**. The manual contains the following chapters:

- *Getting Started* contains a brief product description, information needed to power on the driver and a brief procedure to verify that it functions.
- *Operator Controls* provide an outline of the panel control functions and locations at the front and rear panels. This also includes the location and function of the input/output signals.
- *Operating Basics* gives further details to the operational features of the controllers.
- *Specifications* are described for all input/output levels including other pertinent details and information required for the RS-232 interface.
- *Index* contains a full index.

What follows is the complete operator's manual for the ***UNIBLITZ®*** **VMM-D3 Three Channel Shutter Driver** and **VMM-D4 Four Channel Shutter Driver**. *Please read this manual completely before operating your unit. Due to the construction of this unit, we recommend that the unit be returned to the manufacturer for repair, no user-serviceable parts inside.*

Getting Started

Features

- Three channel (VMM-D3) or four channel (VMM-D4) shutter driver capable of driving up to three or four ***UNIBLITZ*** shutters, respectively.
- Three/four (VMM-D3/VMM-D4) independent inputs to allow individual shutter control.
- One input to open all shutters simultaneously.
- Three/four (VMM-D3/VMM-D4) independent outputs to monitor individual synchronization outputs of each shutter.
- One output to monitor when all individual synchronization outputs are active.
- Manual Open/Close switch for each channel to allow inverse shutter operation.
- Capable of 115 VAC/60 Hz or 230 VAC/50 Hz operation.
- Ships with AC line cord for North America
- Indicator LEDs:
  - Status monitor for each shutter drive input
  - Status monitor for each synchronization output
  - Power On indicator
- Control Switches:
  - Front Panel Normally Open/Normally Closed (N.O/N.C.) switch for individual manual shutter operation
  - Rear panel Energy Select (HI/LO) slide switch for each channel to allow 35 mm and larger shutter operation.
  - Front Panel Address Select switch (SW1) on the **VMM-D3** only used in conjunction with the RS-232C input to select specific unit address when used in a daisy-chain application.
- Small, compact design. Dimensions: (HWD) 2.6 in x 5.5 in x 8.0 in (6.6 cm x 13.9 cm x 20.3 cm)
- Connectors: Two 6-conductor rear panel pluggable terminal strips (5 Volt TTL logic). One strip each for inputs and outputs.
- Four rear panel 7-pin shutter connectors, one per shutter.
- One front panel DB-9 female connector for RS-232C connection **(VMM-D3 only).**
- One Model 710C Shutter Interconnect Cable (length 3 meters) per active channel supplied with the unit.

Start Up

After unpacking your unit inspect for any obvious defects and that all manufacturer supplied materials are present.

If a problem is found, or a part (or parts) is missing, please contact Vincent Associates immediately for problem resolution. Do not attempt to connect the unit if defects or damage are noted until Vincent Associates has been contacted and the problem resolved.

After successful initial inspection the unit is ready to use. To properly install and power on the **VMM-D3** or **VMM-D4,** please follow the procedure below.

1. Check for proper electrical connections. Please note the label covering the AC Input Module. It is there as a reminder to manually configure the AC input module if the unit requires operation at 230VAC 50/60 Hz. The unit is shipped from the factory configured for 115 VAC 50/60 Hz operation. See "**Voltage Change**" instructions elsewhere in this manual.

CAUTION

This label must be removed prior to inserting the power cord into the AC input receptacle regardless of which AC voltage level is used.

2. Check the line fuses to be sure they are the proper rating. The **VMM-D3** and **VMM-D4** are shipped with the proper fuses for 115VAC operation (two 3AG, 0.5A, time-lag). For 230VAC operation, change the two line fuses to 3AG, 0.25A, time-lag (supplied). See "**Line Fuse Replacement**" instructions elsewhere in this manual.
3. Be sure the AC module power switch is toggled to the "0" (OFF) position and the line cord is not connected to the AC line.
4. Connect the supplied line cord to the rear panel AC module connector. Be sure the cord is inserted completely into the AC module receptacle.
5. Connect the line cord to the AC line.
6. Power on the unit by toggling the AC module power switch to the "1" position. Power LED indicator will illuminate.

Line Fuse Replacement

WARNING

To avoid injury or death, unplug the line cord from the line voltage power source before continuing.

1. A small flat-bladed screwdriver or similar tool is needed to complete this procedure, please refer to Figure #1.
2. **BE SURE THE LINE CORD IS DISCONNECTED FROM THE LINE VOLTAGE POWER SOURCE.** ***DO NOT continue with this procedure without removing the line cord from the VMM-D3/D4.***
3. Unplug the line cord from the AC module receptacle**.**
4. Position the **VMM-D3** or **VMM-D4** unit so that the rear panel is facing you.
5. Using the small flat bladed screwdriver or similar tool, insert the tool into the cover door slot, gently pry open cover door.

6. Insert the tool into the fuse holder slot and gently pry out the fuse holder block.
7. Remove defective fuse(s); replace with new fuse(s).
8. Replace fuse holder into housing
9. Close the cover door.

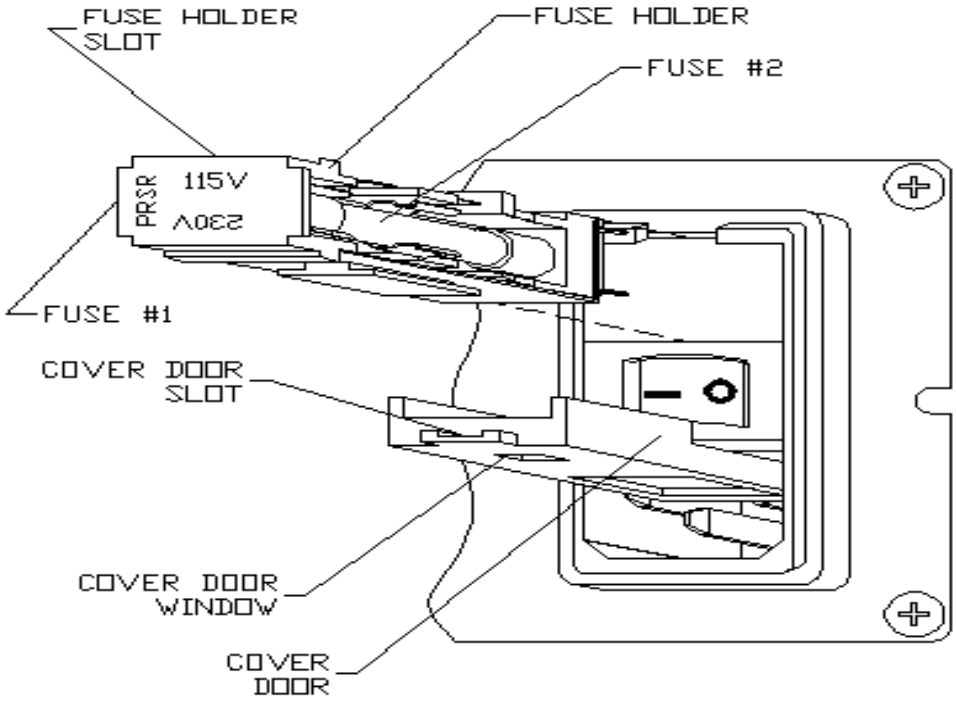

Figure #1 - AC Input Module

Voltage Change

WARNING

To avoid injury or death, unplug the line cord from the line voltage power source before continuing.

1. Please refer to Figure #1.
2. Repeat steps 1-6 in "LINE FUSE REPLACEMENT" instructions.
3. To change from 115 VAC to 230VAC, rotate the fuse holder block 180°.
4. Replace the two 3AG, 0.5A, time-lag fuses with two 3AG, 0.25A, time-lag fuses. (Note: Be sure to change fuses back to 3AG, 0.5A time-lag fuses when changing back to *115VAC).*
5. Replace fuse holder block and close the cover door. The desired line voltage will be indicated in the cover door window.

Shutter Fuse Replacement

1. Please refer to Figures 2 and 3 for VMM-D3 and VMM-D4 panel layouts, respectively.
2. A medium flat-bladed screwdriver or similar tool is needed to complete this procedure.
3. Power the unit OFF and disconnect the line cord from the line voltage power source.
4. Position the VMM-D3 or VMM-D4 unit such that the front panel is facing you. If necessary disconnect the shutter cable(s) from their respective 7-pin SHUTTER connector on the rear panel.
5. Using the screwdriver, or similar, insert the tool into the slot on the Shutter Fuse cap, apply slight inward pressure and rotate the cap 1/8 turn, counterclockwise. The fuse cap will pop out slightly.
6. Remove the fuse cap and fuse.
7. Replace the fuse with a known good one. Shutter Fuse is: 0.6A, 5 x 20 mm, time-lag (slo-blo).
8. Reverse the procedure to re-install the fuse cap, reconnect all cables and power the unit back up.

Initial Operation and Testing

WARNING

WARNING: Be sure power switch is in the off position before connecting power cord to line. Attach line cord to the unit first before plugging into the AC power source.

1. The **VMM-D3** and **VMM-D4** are manually selectable to operate from 115 VAC or 230VAC (50-60Hz). **PLEASE BE SURE THAT THE UNIT IS PROPERLY SET UP FOR THE LINE VOLTAGE TO BE USED.** Refer to the **Voltage Change** section of this manual for further information and procedures.
2. Once the line cord has been attached to unit and connected to properly grounded wall receptacle, the unit may be energized. See "**Start Up**" section.
3. Insert the 7-pin male connector of shutter interconnect cable into 7-pin female receptacle at rear of unit labeled SHUTTER.
4. Connect the 7- pin female connector of shutter-interconnect cable to 7- pin male connector on shutter to be driven.
5. Place POWER switch to the ON "1" position, the POWER LED will illuminate.
6. Place the N.O./N.C. switch into the N.O. position. The shutter will open and remain open until the switch is returned to the N.C. position. The SHUTTER ACTIVE LED will illuminate when this switch is in the N.O. position.
7. All ***UNIBLITZ*** drivers provide the circuitry necessary to support shutters equipped with the solid state synchronization option. Simply plug the shutter-interconnect cable into the driver. If the shutter is equipped with this option, the green LED labeled SYNC ACTIVE will illuminate when the shutter is in the open position. In addition, the active-low SYNC output of the OUTPUT CONTROL terminal strip will change to the low state when the shutter is open. The absence of the solid state synchronization option will inhibit the operation of the SYNC output and SYNC ACTIVE LED. The remainder of the **VMM-D3** and **VMM-D4** systems will not be affected.
8. See specifications and operator controls for additional operational information concerning other features of the **VMM-D3** and **VMM-D4**.
9. Should the shutter and/or controller not respond as described previously, be sure line cord is installed into the AC receptacle and connections to the shutter are made properly. Note that the shutter output is also fused (located at the front panel (0.6A, 5 x 20 mm, time-lag (slo-blo)). Check these fuses for failure. Please refer to the SHUTTER FUSE REPLACEMENT section of this manual.
10. Be advised, a visual inspection of a fuse is usually NOT an adequate test to determine if a fuse failure has occurred. Use a DMM (Digital Multi-Meter) or equivalent test device to determine fuse continuity.

CAUTION

Turn off the unit and remove the plug from the ac source before checking for blown fuses

11. Additionally, please note that particular shutter units respond to different minimum pulse widths. For example, a standard VS25 shutter has a minimum exposure pulse of 6 ms. If the timing is set for an exposure pulse width less than 6 ms the shutter may not open fully.
12. If the unit still does not operate properly, turn off and disconnect the unit. Please notify Vincent Associates immediately. There are no user-serviceable parts outside or inside of the unit.

Operator Controls

VMM-D3/VMM-D4 Front Panel Operator Controls

Please refer to Figures 2 and 3, respectively, for **VMM-D3** and **VMM-D4** Front Panel layouts, respectively, to become familiar with the placement of the various controls.

VMM-D3

1. Three twist-lock SHUTTER FUSE caps to protect each corresponding fuse. Replace with fuse type 0.6A, 5 x 20 mm, time-lag (slo-blo).
2. Three toggle switches labeled N.O./N.C., one each to allow manual opening and closing of each of the three corresponding shutters.
3. Three green LEDs, one each to independently monitor shutter SYNC status.
4. Three red LEDs, one each to independently monitor shutter drive status.
5. One, DB-9 Female, RS-232C connector.
6. One ADDRESS SELECT switch labeled SW1 (VMM-D3 only) – used in conjunction with the RS-232C input to select specific address for the unit when used in a daisy-chain application.
7. One red LED Power On/Off indicator.

VMM-D4

1. Four twist-lock SHUTTER FUSE caps to protect each corresponding fuse. Replace with fuse type 0.6A, 5 x 20 mm, time-lag (slo-blo).
2. Four toggle switches labeled N.O./N.C., one each to allow manual opening and closing of each of the four corresponding shutters.
3. Four green LEDs, one each to independently monitor shutter SYNC status.

4. Four red LEDs, one each to independently monitor shutter drive status.
5. One red LED Power On/Off indicator.

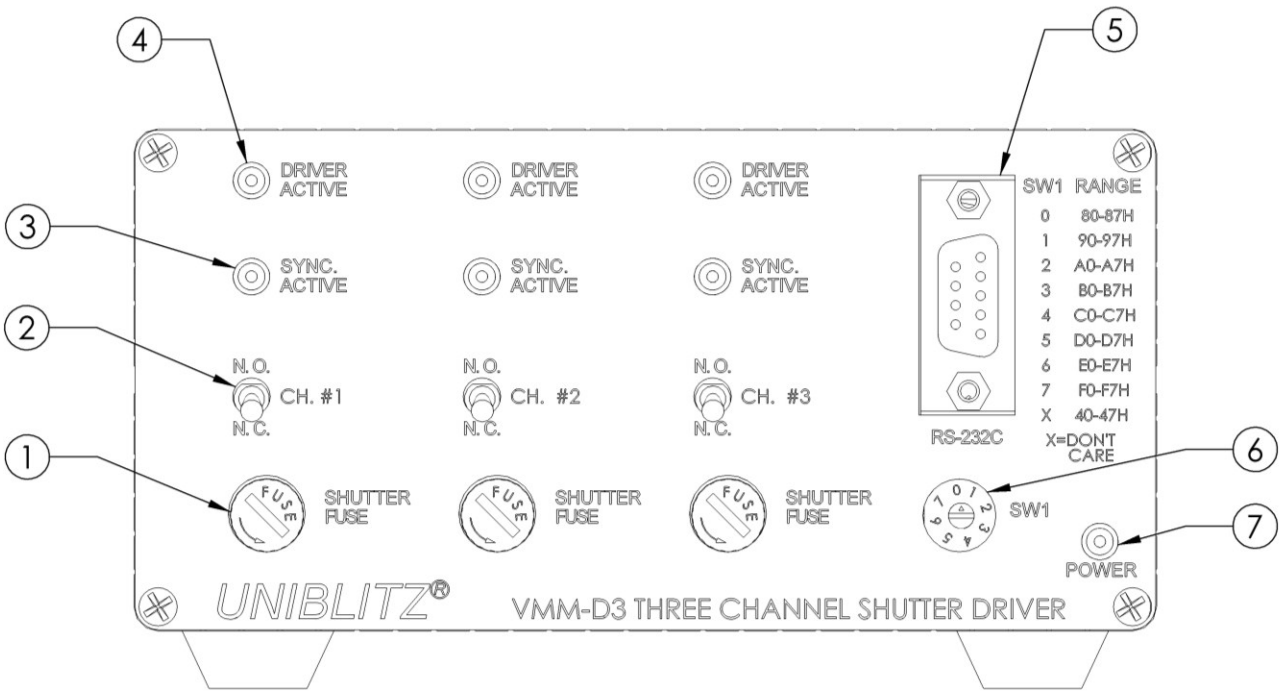

Figure 2: VMM-D3 Front Panel Layout

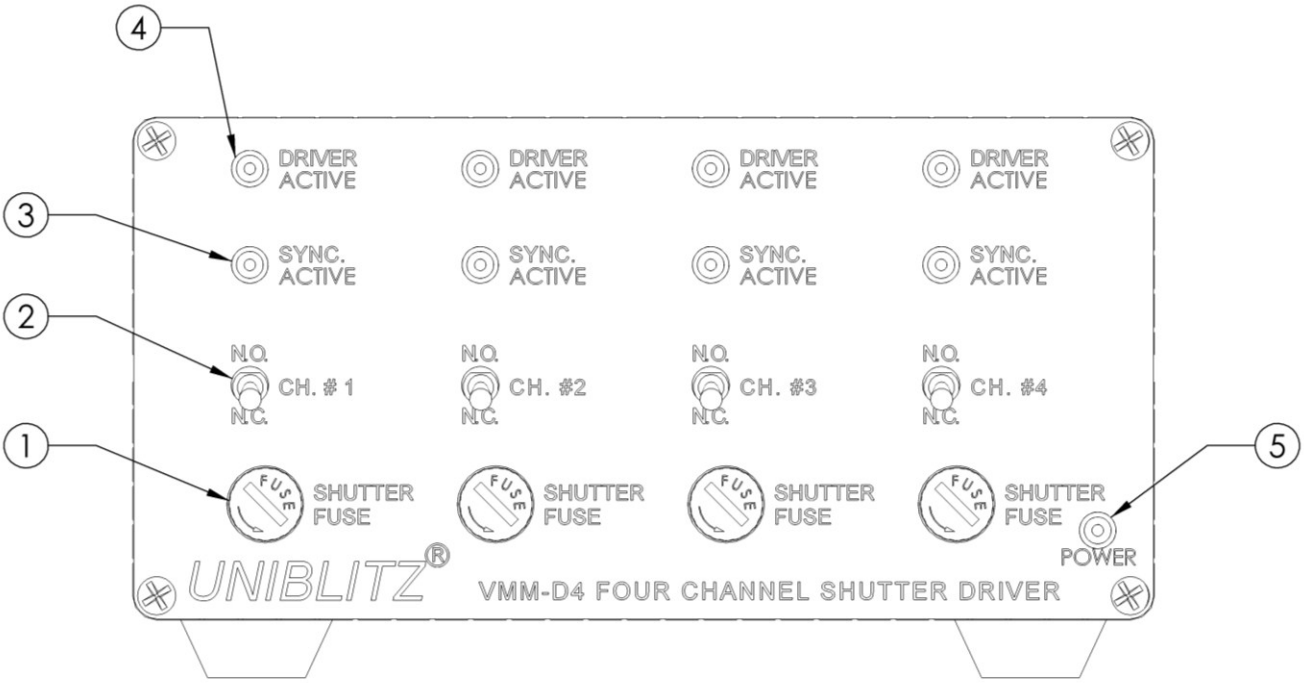

Figure 3: VMM-D4 Front Panel Layout

VMM-D3/VMM-D4 Rear Panel Operator Controls

Please refer to Figure 4 for **VMM-D3** and **VMM-D4** rear panel layouts, respectively. Please note that both units' rear panels are identical.

1. One 3-conductor IEC type power receptacle AC Input module containing: 115VAC/230VAC line voltage indicator, fuses, and power On/Off switch.
2. One 6 conductor pluggable terminal strips labeled OUTPUT CONTROL. Uses 5V-TTL logic.
3. One 6 conductor pluggable terminal strips labeled INPUT CONTROL. Uses 5V-TTL logic.
4. Four Energy Select HI/LO slide switches to allow operation with 35 mm and larger aperture shutter types. *Note: Channel 4 is disabled on the **VMM-D3** only.*
5. Four 7-pin SHUTTER connectors, 1 per shutter. *Note: Channel 4 is disabled on the **VMM-D3** only.*

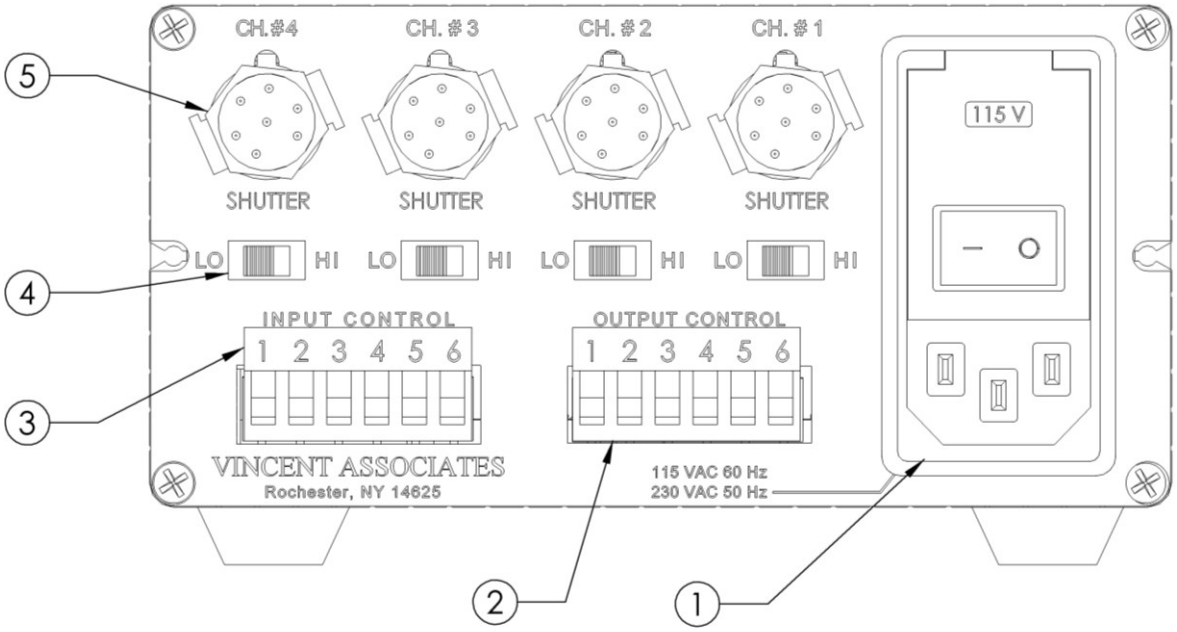

Figure 4: VMM-D3 and VMM-D4 Rear Panel Layout

Operating Basics

Please refer to the **INITIAL OPERATION AND TESTING** section of this manual for initial preparations to place the **VMM-D3** or **VMM-D4** into operation.

HI/LO Energy Slide Switch Settings:

The **HI/LO** Energy Slide Switch selects High or Low pulse energy to drive the selected shutter(s).

CAUTION

The HIGH energy setting must be used for only the 35mm and larger aperture shutters. Use the LOW position for all other Uniblitz shutters. Use of the HIGH position for shutter apertures smaller than 35 mm will damage the shutter and will void the shutter's limited warranty

- Select the **HI** energy setting to operate 35 mm and larger shutter aperture types.
- Select the **LO** energy setting to operate shutter types with 25 mm and smaller apertures.

Connection Guide

Six Conductor Pluggable Terminal Strips

The following provides pin-outs for the six conductor pluggable terminal strips (input and output):

Pin	State	Shutter Device	Signal High	Signal Low
1	Active High	1	Open	Closed
2	Active High	2	Open	Closed
3	Active High	3	Open	Closed
4	Active High	4 (VMM-D4 only)	Open	Closed
5	Active High	1-3 (VMM-D3 only) 1-4 (VMM-D4 only)	Open	Closed
6	Signal Ground	N/A	N/A	N/A

Six Conductor Pluggable Terminal Strip - INPUT CONTROL (5VTTL logic)

Pin	State	Shutter Device	Signal Low	Signal High
1	Active Low	1	Open	Closed
2	Active Low	2	Open	Closed
3	Active Low	3	Open	Closed
4	Active Low	4 (VMM-D4 only)	Open	Closed
5	Active Low	1-3 (VMM-D3 only) 1-4 (VMM-D4 only)	Open	Closed
6	Signal Ground	N/A	N/A	N/A

Six Conductor Pluggable Terminal Strip - OUTPUT CONTROL (5VTTL logic)

7-Pin Shutter Connections

The following provides pin-outs for the four 7-pin SHUTTER connectors:

Pin	Function
A	Shutter Send
B	Shutter Return
C	Sync Diode Source
D	Sync Diode Ground
E	Sync Transistor Output
F	Sync +6.75 VDC Source
H	Shutter Ground

Four 7-Pin Shutter Connectors, One per Shutter
Note: Channel #4 Disabled - VMM-D3 Only

Please refer to Figure 5 below for the pin-out and SYNC cable layout for the 7-pin connector.

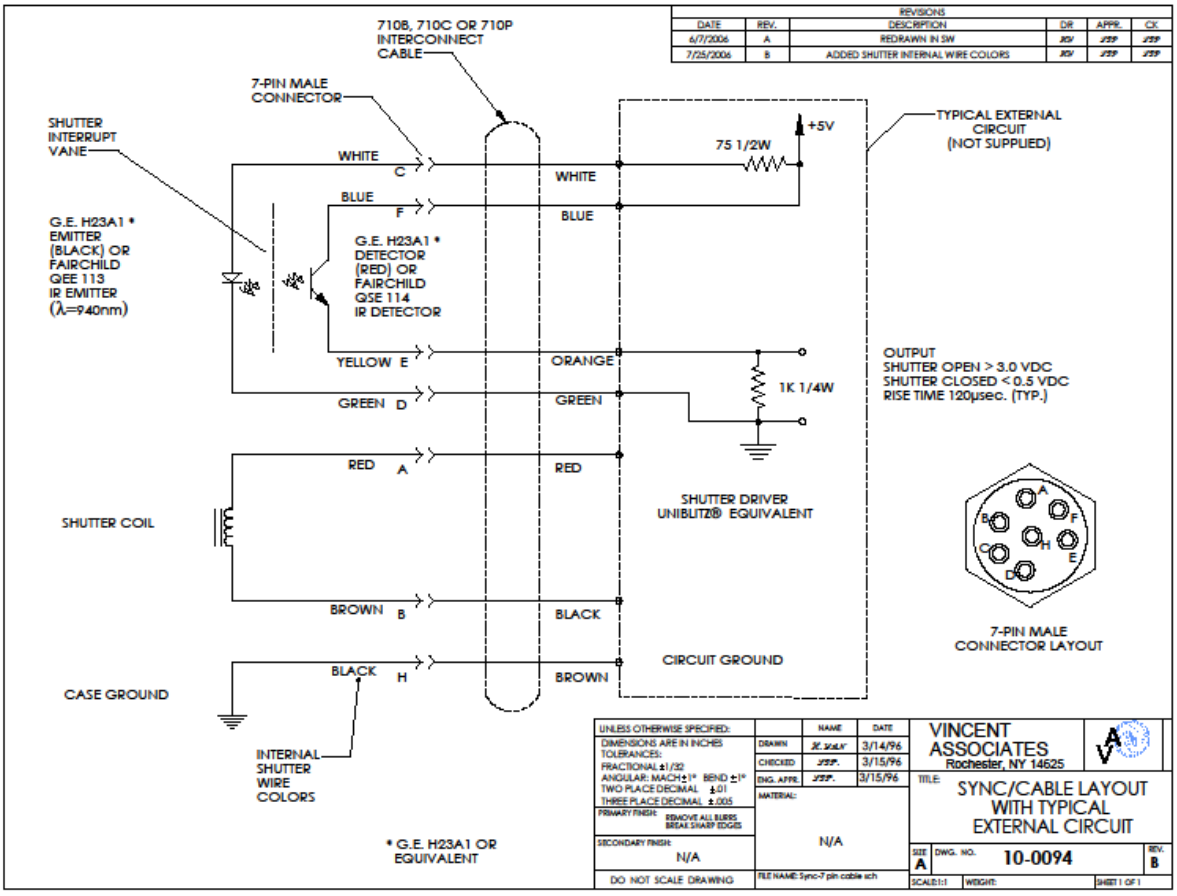

Figure 5: Pin-Out and SYNC Cable Layout for 7-Pin Connector

RS-232C Operation (VMM-D3 Only)

The **VMM-D3** inputs can be controlled via an RS-232C computer serial signal (COM port). From a computer's RS-232C serial port connect a cable such as the **910RS** cable (not supplied) or a user-constructed cable with connections as enumerated in the INPUT SPECIFICATIONS to the user's RS-232C interface. The RS-232 input is configured in ***the null modem configuration***. Connect the Tx (transmit) from the host to the Rx (receive) on the **VMM-D3** control unit. All other lines should have the same pin-out from the host provided the host uses a 9-pin D-Sub connector.

If the host contains a 25-Pin D-Sub or an 8-Pin Mini-DIN, check the computer's user manual to find the proper corresponding pin-outs. A cable will need to be constructed or a proper adapter purchased to connect to the host. In most cases the corresponding 25-Pin D-Sub pin-out and MAC 8-Pin Mini-DIN are as follows:

Function		VMM DB-9F	IBM DB-9M	IBM DB-25M	MAC Mini-DIN-8F
Rx	Receive Data	2	2	3	5
Tx	Transmit Data	3	3	2	3
GND	Signal Ground	5	5	7	4

Pin-Out Comparison for Various Serial COM Ports

All other pins not used. Be sure to connect the Tx pin, Pin 3 from the IBM 9-Pin D-Sub (or Pin 2 from the 22-Pin D-Sub) male connector to the Rx pin, Pin 2 of the **VMM-D3** front panel 9-Pin D-Sub connector for proper operation. Connect all other functions as indicated above.

By sending the proper commands, the unit will respond by activating the proper function. The program listed on page 25 of this manual will allow operation of the **VMM-D3** from the computer keyboard.

Up to eight **VMM-D3** units can be daisy-chained together (connected through the same serial port) using the **910RSDC** cable. One cable is required for each controller in the chain. Figure 6 illustrates connecting two controllers from a single serial port. Once connected, each unit will require a unique address in the chain. This is accomplished by adjusting the octal switch SW1 to the desired command range. (See "SW1 Address Select" under GENERAL CHARACTERISTICS in the SPECIFICATIONS section for a complete listing of the command range for each octal switch position.) The specific command range set will decode commands sent via the serial port. A set of "ALL" commands is also available to control all units connected to the serial port.

The Table below lists the DB-9 female, RS-232C connection pin-out **(VMM-D3 only).**

Pin	Function	
1	CD	Carrier Detect
2	Rx	Receive Data
3	Tx	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator

DB-9 Female, RS-232C Connection Pin-Out (VMM-D3 Only)

RS-232C (DB-9 female)	• Baud rate 9600 • 8 Data bits • 1 Stop bit • No parity • No flow control • 8 commands available • 1 global address location for commands • 8 local address locations for commands • See "SW1 Address Select" specification for switch settings of local address locations

	Global Address Codes				
RS232 Commands	Decimal	HEX	Octal	Binary	ASCII
Open Ch. #1	64	40	100	01000000	@
Close Ch.#1	65	41	101	01000001	A
Open Ch. #2	66	42	102	01000010	B
Close Ch.#2	67	43	103	01000011	C
Open Ch. #3	68	44	104	01000100	D
Close Ch.#3	69	45	105	01000101	E
All Open	70	46	106	01000110	F
All Close	71	47	107	01000111	G

RS232C Command Protocol

ADDRESS Select (SW1)	Allows selection of individual (local) address locations of commands sent by a PC's serial port.									
RS232 Commands	ADDRESS Switch Positions (x = don't care or global)									
	x	0	1	2	3	4	5	6	7	
Open Ch. #1	40	80	90	A0	B0	C0	D0	E0	F0	(Hex)
Close Ch.#1	41	81	91	A1	B1	C1	D1	E1	F1	(Hex)
Open Ch. #2	42	82	92	A2	B2	C2	D2	E2	F2	(Hex)
Close Ch.#2	43	83	93	A3	B3	C3	D3	E3	F3	(Hex)
Open Ch. #3	44	84	94	A4	B4	C4	D4	E4	F4	(Hex)
Close Ch.#3	45	85	95	A5	B5	C5	D5	E5	F5	(Hex)
All Open	46	86	96	A6	B6	C6	D6	E6	F6	(Hex)
All Close	47	87	97	A7	B7	C7	D7	E7	F7	(Hex)

Hex Address Assignments

Daisy-Chain Configuration

Up to eight VMM-D3 units can be daisy-chained together (connected through the same serial port) using the **910RSDC** cable (not supplied). This provides for control of up to 24 shutters from one computer COM serial port. One of these daisy-chain cables is required for each

controller in the chain. Figure 6 illustrates connecting two controllers from a single serial port. Once connected, each unit will require a unique address in the chain. This is accomplished by adjusting the octal switch labeled SW1 located beneath the 9-Pin D-sub connector on the front panel to the desired command range. Please see "SW1 Address Select" elsewhere in this manual for a complete listing of the command range for each octal switch position. The specific command range set will decode commands sent via the serial port. A set of "ALL" commands is also available to control all units connected to the serial port. For a single unit not requiring a daisy-chain configuration, a **910RS** cable (not supplied) can be used. Please refer to Figure 6.

Figure 6: VMM-D3 Daisy-Chain Cable Configuration

RS-232C Test Program

The following is a test program written to test the input commands to the RS-232C interface of the **VMM-D3/D4** controllers. This program and LabView programs (not listed) are available by downloading from the **RESOURCES** section of our web site (www.***UNIBLITZ***.com), request via e-mail (vincentassociates@***UNIBLITZ***.com), or calling (800) 828-6972. Other programs may be available, please contact technical support for further information.

REM PROGRAM TO SEND COMMAND PULSES TO VMM-D3 RS232 INTERFACE, XILINX CPLD.

```
REM WRITTEN BY RICHARD ST.LOUIS, VINCENT ASSOCIATES.
REM LAST REVISION 8/2/99.


CLS 0
K = -1
WHILE K
        OPEN "COM1:9600,N,8,1,CS0,DS0" FOR RANDOM AS #1
        J = 64
        C$ = "X"

MENU:       PRINT
            PRINT
            PRINT
            PRINT "WAITING FOR KEYSTROKE COMMAND  "
            PRINT "TYPE:"
            PRINT "         VMM-D3           "
            PRINT "         ------           "
            PRINT "     O - OPEN  Ch. 1       "
            PRINT "     C - CLOSE Ch. 1       "
            PRINT "     P - OPEN  Ch. 2       "
            PRINT "     L - CLOSE Ch. 2       "
            PRINT "     N - OPEN  Ch. 3       "
            PRINT "     E - CLOSE Ch. 3       "
            PRINT "     A - ALL Ch.'s OPEN    "
            PRINT "     R - ALL Ch.'s CLOSE   "
            PRINT
            PRINT "     S - SET Octal Switch Address "
            PRINT "        (Current Starting Decimal # ="; J; ")"
            PRINT "        (Current Octal Address Value = "; C$; ")"
            PRINT
            PRINT "     Q - QUIT Program         "
            PRINT
            PRINT

START: A$ = INKEY$
            IF A$ = "O" OR A$ = "o" THEN
                    PRINT #1, CHR$(J);
                    PRINT "Ch. 1 OPEN COMMAND SENT"
                    GOSUB TIMEOUT
                    GOTO MENU
                    ELSEIF A$ = "C" OR A$ = "c" THEN
                            PRINT #1, CHR$(J + 1);
                            PRINT "Ch. 1 CLOSE COMMAND SENT"
                            GOSUB TIMEOUT
                            GOTO MENU
```

```
                ELSEIF A$ = "P" OR A$ = "p" THEN
                        PRINT #1, CHR$(J + 2);
                        PRINT "Ch. 2 OPEN COMMAND SENT"
                        GOSUB TIMEOUT
                        GOTO MENU
                ELSEIF A$ = "L" OR A$ = "l" THEN
                        PRINT #1, CHR$(J + 3);
                        PRINT "Ch. 2 CLOSE COMMAND SENT"
                        GOSUB TIMEOUT
                        GOTO MENU
                ELSEIF A$ = "N" OR A$ = "n" THEN
                        PRINT #1, CHR$(J + 4);
                        PRINT "Ch. 3 OPEN COMMAND SENT"
                        GOSUB TIMEOUT
                        GOTO MENU
                ELSEIF A$ = "E" OR A$ = "e" THEN
                        PRINT #1, CHR$(J + 5);
                        PRINT "Ch. 3 CLOSE COMMAND SENT"
                        GOSUB TIMEOUT
                        GOTO MENU
                ELSEIF A$ = "A" OR A$ = "a" THEN
                        PRINT #1, CHR$(J + 6);
                        PRINT "ALL Ch.'s OPEN COMMAND SENT"
                        GOSUB TIMEOUT
                        GOTO MENU
                ELSEIF A$ = "R" OR A$ = "r" THEN
                        PRINT #1, CHR$(J + 7);
                        PRINT "ALL Ch.'s CLOSE COMMAND SENT"
                        GOSUB TIMEOUT
                        GOTO MENU
                ELSEIF A$ = "Q" OR A$ = "q" THEN
                        K = 0
                        PRINT "PROGRAM TERMINATED"
                ELSEIF A$ = "S" OR A$ = "s" THEN
                   INPUT "ENTER OCTAL ADDRESS 0 - 7 or X: ", B$
                   GOSUB ADDRESS
                   GOTO MENU
                ELSE GOTO START
        END IF
WEND
END


TIMEOUT:    FOR I = 1 TO 100: NEXT I
                CLS 0
                RETURN
```

```
ADDRESS:    IF B$ = "X" OR B$ = "x" THEN
                                    J = 64
                                    C$ = "X"
                                    ELSEIF B$ = "0" THEN
                                    J = 128
                                    C$ = "0"
                                    ELSEIF B$ = "1" THEN
                                    J = 144
                                    C$ = "1"
                                    ELSEIF B$ = "2" THEN
                                    J = 160
                                    C$ = "2"
                                    ELSEIF B$ = "3" THEN
                                    J = 176
                                    C$ = "3"
                                    ELSEIF B$ = "4" THEN
                                    J = 192
                                    C$ = "4"
                                    ELSEIF B$ = "5" THEN
                                    J = 208
                                    C$ = "5"
                                    ELSEIF B$ = "6" THEN
                                    J = 224
                                    C$ = "6"
                                    ELSEIF B$ = "7" THEN
                                    J = 240
                                    C$ = "7"
                                    ELSE J = 64
                                          C$ = "X"
            END IF
            PRINT "STARTING ASCII DECIMAL # = ", J
            GOSUB TIMEOUT
            CLS 0
            RETURN
```

Dimensions

The overall dimensions of the **VMM-D3** and **VMM-D4** are shown below in Figure 7.

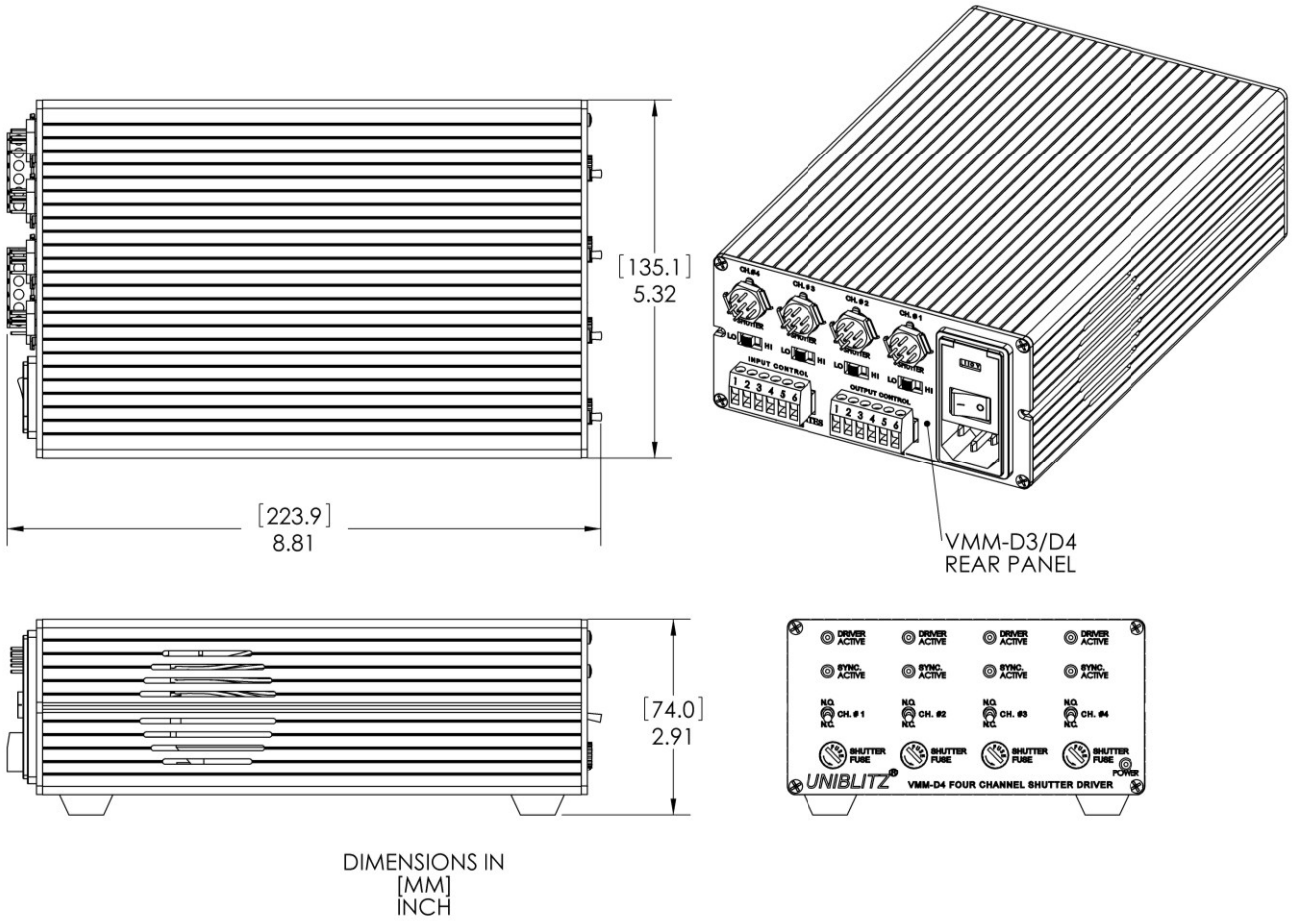

Figure 7: Overall VMM-D3 and VMM-D4 Dimensions

Maintenance

There are no user-serviceable parts outside or inside of the VMM-D3/D4. Other than exterior inspection for visible damage of the case and line cord and exterior cleaning, there is no service to be performed by the user other than Fuse Replacement or Line Voltage Change procedures.

General Care

Perform routine inspection of the VMM-D3/D4 on a regular basis.

Inspect the outer case for any signs of visible damage

Pay particular attention to the condition of the AC line cord. If there are any signs of damage or deterioration, replace it immediately with an approved line cord.

Follow the **Exterior inspection and Cleaning Procedures** elsewhere in this manual.

Inspection and Cleaning

Inspection – Exterior

Inspect the outside of the **VMM-D3/D4** for damage, wear, and missing parts. Please be advised that if the unit appears to have been dropped or shows other signs of exterior damage it should be checked thoroughly to verify correct operation and performance. If damage is suspected, please return the unit to the factory for repair – there are no user-serviceable parts.

Cleaning Procedure – Exterior

1. Remove loose dust on the outside of the **VMM-D3/D4** with a lint free cloth.
2. Remove remaining dirt with a lint free cloth dampened in a general purpose detergent-and-water solution. Do not use abrasive cleaners.

CAUTION	*To prevent getting moisture inside the unit during external cleaning, use only enough liquid to dampen the cloth or applicator.*

Inspection – Interior

*Do not attempt to open the case of the **VMM-D3/VMM-D4** under any circumstances. There are no user-serviceable parts inside the case.*

Cleaning Procedure – Interior

*Do not attempt to open the case of the **VMM-D3/VMM-D4** under any circumstances. There are no user-serviceable parts inside the case.*

Specifications

System Characteristics

VMM-D3	VMM-D4	Name	Description
√	√	Repeat Exposure	• 50 msec, minimum, between exposures • 120 msec, minimum, for 35 mm , and larger shutters
√	√	Shutter Drive	• Continuously variable frequency of exposures from DC to the shutter's maximum rate • Maximum peak pulse power 400 W • Pulse voltage 70 VDC • Pulse current 5.7 A • Test conditions: standard 5 Volt, 12 ohm coil cycled with 20 msec exposure at 5 Hz.
√	√	Repetition Rate	• Maximum repetition rate determined by applicable shutter • Maximum rate derated by 75% when more than one shutter channel is used.

External Input Characteristics

VMM-D3	VMM-D4	Name	Description
√	√	Channel #1 Pulse In (INPUT CONTROL) Pin 1 Rear Panel	• Active-high only • Input impedance 4.7K ohms • Minimum pulse width determined by applicable shutter • Maximum pulse width unlimited • TTL compatible: – Minimum high-level +2.0 VDC – Maximum low-level +0.8 VDC – Sink current 1µA.
√	√	Channel #2 Pulse In (INPUT CONTROL) Pin 2 Rear Panel	• Active-high only • Input impedance 4.7K ohms • Minimum pulse width determined by applicable shutter • Maximum pulse width unlimited • TTL compatible: – Minimum high-level +2.0 VDC – Maximum low-level +0.8 VDC – Sink current 1µA.

VMM-D3	VMM-D4	Name	Description
√	√	Channel #3 Pulse In (INPUT CONTROL) Pin 3 Rear Panel	• Active-high only • Input impedance 4.7K ohms • Minimum pulse width determined by applicable shutter • Maximum pulse width unlimited • TTL compatible: – Minimum high-level +2.0 VDC – Maximum low-level +0.8 VDC – Sink current 1µA.
	√	Ch. #4 Pulse In (INPUT CONTROL) Pin 4 Rear Panel	• Active-high only • Input impedance 4.7K ohms • Minimum pulse width determined by applicable shutter • Maximum pulse width unlimited • TTL compatible: – Minimum high-level +2.0 VDC – Maximum low-level +0.8 VDC – Sink current 1µA.
√	√	All Channels Pulse In (INPUT CONTROL) Pin 5 Rear Panel	• Active-high only • Input impedance 4.7K ohms • Minimum pulse width determined by applicable shutter • Maximum pulse width unlimited • TTL compatible: – Minimum high-level +2.0 VDC – Maximum low-level +0.8 VDC – Sink current 1µA.
√	√	Signal Ground Input (INPUT CONTROL) Pin 6 Rear Panel	• 0 VDC ground reference provided for INPUT CONTROL trigger signal pins 1 through 5.
√		Serial Input RS-232C (DB-9 female) Front Panel	• Baud rate 9600 • 8 Data bits • 1 Stop bit • No parity • No flow control • 8 commands available • 1 global address locations for commands • 8 local address locations for commands • See SW1 specification for switch settings of local address locations • Command transmission time: 0.94 msec

VMM-D3	VMM-D4	Name	Description				
			Global Address Code Locations				
		RS232 Commands	Decimal	HEX	Octal	Binary	ASCII
√		Open Ch. #1	64	40	100	01000000	@
√		Close Ch. #1	65	41	101	01000001	A
√		Open Ch. #2	66	42	102	01000010	B
√		Close Ch. #2	67	43	103	01000011	C
√		Open Ch. #3	68	44	104	01000100	D
√		Close Ch. #3	69	45	105	01000101	E
√		All Open	70	46	106	01000110	F
√		All Close	71	47	107	01000111	G

External Output Characteristics

VMM-D3	VMM-D4	Name	Description
√	√	Ch. #1 SYNC. Output (OUTPUT CONTROL) Pin 1 Rear Panel	• Active-low only • Source impedance 1K ohms • Maximum source current 5.0 mA • Maximum sink current 100 mA • Maximum (low-level) output voltage: +0.5 VDC. • This output provided for shutter equipped with Electronic Sync. option.
√	√	Ch. #2 SYNC. Output (OUTPUT CONTROL) Pin 2 Rear Panel	• Active-low only • Source impedance 1K ohms • Maximum source current 5.0 mA • Maximum sink current 100 mA • Maximum (low-level) output voltage: +0.5 VDC. • This output provided for shutter equipped with Electronic Sync. option.
√	√	Ch. #3 SYNC. Output (OUTPUT CONTROL) Pin 3 Rear Panel	• Active-low only • Source impedance 1K ohms • Maximum source current 5.0 mA • Maximum sink current 100 mA • Maximum (low-level) output voltage: +0.5 VDC.

			• This output provided for shutter equipped with Electronic Sync. option.
VMM-D3	**VMM-D4**	**Name**	**Description**
	√	Ch. #4 SYNC. Output (OUTPUT CONTROL) Pin 4 Rear Panel	• Active-low only • Source impedance 1K ohms • Maximum source current 5.0 mA • Maximum sink current 100 mA • Maximum (low-level) output voltage: +0.5 VDC. • This output provided for shutter equipped with Electronic Sync. Option
√	√	All Ch.'s SYNC. Output (OUTPUT CONTROL) Pin 5 Rear Panel	• Active-low only • Source impedance: 10K ohms • Maximum source current: 5.0 mA • Maximum sink current: 100 mA • Maximum (low-level) output voltage: +0.5 VDC. • This output provided for shutter equipped with Electronic Sync. option.
√	√	SYNC. Ground Output (OUTPUT CONTROL) Pin 6 Rear Panel	• 0 VDC ground reference provided for OUTPUT CONTROL Sync. pins 1 through 5.

General Characteristics

VMM-D3	VMM-D4	Name	Description
√	√	POWER Indicator Front Panel	• Red 3mm LED indicates when power is available.
√	√	DRIVER ACTIVE Indicator Front Panel	• Red 3mm LED indicates when each shutter driver circuit is active. • This LED will illuminate with or without the load of a shutter's actuator coil.
√	√	SYNC. ACTIVE Indicator Front Panel	• Green 3mm LED indicates when each shutter's opto-electronic synchronous circuit option is active. • SYNC. OUTPUT will be low only when this LED is illuminated.
√		SW1 Address Select Front Panel	• Allows selection of individual (local) address locations of commands sent by a computer's serial port (see test program).

VMM-D3	VMM-D4	Name	Description
		RS232 Commands	***SW1 ADDRESS Switch Locations (x = don't care or global)***
			x 0 1 2 3 4 5 6 7
√		Open Ch. #1	40 80 90 A0 B0 C0 D0 E0 F0 (HEX)
√		Close Ch. #1	41 81 91 A1 B1 C1 D1 E1 F1 (HEX)
√		Open Ch. #2	42 82 92 A2 B2 C2 D2 E2 F2 (HEX)
√		Close Ch. #2	43 83 93 A3 B3 C3 D3 E3 F3 (HEX)
√		Open Ch. #3	44 84 94 A4 B4 C4 D4 E4 F4 (HEX)
√		Close Ch. #3	45 85 95 A5 B5 C5 D5 E5 F5 (HEX)
√		All Open	46 86 96 A6 B6 C6 D6 E6 F5 (HEX)
√		All Close	47 87 97 A7 B7 C7 D7 E7 F7 (HEX)
√	√	HI-LO Energy Select Rear Panel	• HI/LO Slide-switch: – "HI" position allows the selection of appropriate pulse energy for 35 mm and larger shutters – "LO" Position for shutters 25 mm and smaller aperture • Located on rear panel underneath each respective 7-pin shutter connector.
√	√	Power Requirements	• 115 VAC ±5%, 60 Hz or 230 VAC ±10%, 50 Hz. • Selected manually by rotating the fuse-holder of the AC power entry module (located on rear panel). • See "Voltage Change" instructions.
√	√	Fuse Requirements	Two 3AG, 0.5 Amp slow blow for 115 VAC line
√	√		Two 3AG, 0.25 Amp, slow blow for 230 VAC line
√	√		One 5 x 20 mm, 0.6 Amp, slow blow for each Shutter coil
√	√		See "Voltage Change" instructions for AC power fuse change.
√	√	Operating Temperature	0° to 50° C (32° to 122° F)

VMM-D3	VMM-D4	Name	Description
√	√	Storage Temperature	-20° to 55° C (-4° to 131° F)
√	√	Size (HWD)	2.638" x 5.354" x 8.186" (67.0 x 136.0 x 207.9 mm)
√		Weight	4.45 lbs (2.02 kg)
	√		4.55 lbs (2.06 kg)
√	√	Accessories (supplied)	• 710C shutter interconnect cable (1 each per channel)
√	√		• AC line cord, IEC type for North America
√	√		• 230 VAC line fuses (Two ¼ Amp, Slo-Blo fuses, 3AG)
√	√		• User Manual
√	√		• Checklist
√	√	Optional Accessories	910RS RS-232C interconnect serial cable
√	√		910RSDC RS-232C Daisy-Chain interconnect serial cable
√	√		7M/4F shutter-adapter cable

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